

It thus appears that at these stations, as also along the entire belt from Louisiana to New Jersey, cold north and east winds met, and perhaps, to a slight extent, under-run the warm south and west winds, the contest between the two being maintained with great uniformity for 48 hours. The examination of the movement of the upper clouds, as far as they could be observed when the belt was most distinctly marked on the afternoon of the 22nd, shows that while the crowded isothermal lines bounded the regions of north and south surface winds, they also bounded the regions, respectively, of the northeast and southwest upper currents, into which directions the surface winds were respectively turned after their ascension. The heaviest rain seems to have been falling on the north side of the dividing belt at the time of each report. As has been mentioned in the study of the Storm No. XI, this belt of isotherms disappeared on the development of that storm-centre.

## PRECIPITATION.

The monthly chart of precipitation shows that there has been a very great excess in the South Atlantic States, and a decided excess in the Western Gulf States and the Ohio valley. In compiling this chart use has been made of the reports of voluntary observers, in addition to those of the Signal Corps.

On the 21st and 22d, at Nashville, there fell 5.96 inches in 36 hours, being the heaviest rainfall ever recorded there.

## RIVERS.

The Missouri river at the end of the month was at about the same height as at the beginning, both at Leavenworth and at St. Louis, having in the interval risen and again fallen from one to three feet. The Ohio fell, with but slight interruption, until the 13th of the month, when a sudden rise of about eight feet occurred in the upper portion of the river, producing by the 20th a rise of fifteen feet at Cincinnati. The extensive rain of the 23d and 24th, throughout the Ohio valley, caused a very general rise, which was especially marked at Nashville. At the close of the month the river stood at Cincinnati, Louisville and Cairo from eight to twelve feet above its position at the middle of the month. The Upper Mississippi has varied but slightly, and at the close of the month averaged about one foot lower than at the beginning; below St. Louis it has varied considerably, and at Cairo, Memphis and Vicksburg closed from four to six feet higher than at the beginning of the month. The wave of high water, which, on the 28th, was passing Cairo and Memphis, had not at that time reached Vicksburg.

## ICE IN RIVERS, & C.

During the month the ice has averaged sixteen inches in thickness at Dubuque, and twenty-one and three-quarters at La Crosse. At Keokuk the river was clear of ice on the 11th and 27th, but full of thin ice at the other days of observations. At Detroit on the 12th the river was almost free of ice. At Toledo the ice broke up on the 15th. At Buffalo the river and lake continued frozen during the month. At Rochester at the beginning of the month the ice was from six to eight inches thick, and at the close from twelve to eighteen inches.